In the Claims:

1. - 59. (Cancelled)

60. (New) A downhole tool system comprising:

a first downhole component;

a second downhole component positioned relative to the first downhole component; and

a seal element positioned between and in sealing contact with the first and second downhole components, the seal element comprising an elastomer host material and a nanomaterial integrated with the elastomer host material to form a nanocomposite material, the nanomaterial selected from carbon nanotubes and carbon nanofibers.

61. (New) The downhole tool system as recited in claim 60 wherein the elastomer host material further comprises a copolymer of acrylonitrile and butadiene.

62. (New) The downhole tool system as recited in claim 60 wherein the elastomer host material is selected from the group consisting of acrylonitrile butadiene, carboxylated acrylonitrile butadiene, hydrogenated acrylonitrile butadiene, highly saturated nitrile, carboxylated hydrogenated acrylonitrile butadiene, hydrogenated carboxylated acrylonitrile butadiene, ethylene propylene, ethylene propylene diene, tetrafluoroethylene and propylene, fluorocarbon and perfluorocarbon.

63. (New) The downhole tool system as recited in claim 60 wherein the nanomaterial has a dimension in the range of approximately 0.1 nanometer to approximately 500 nanometers.

64. (New) The downhole tool system as recited in claim 60 wherein the seal element comprises a seal selected from the group consisting of O-ring seals, D-seals, T-seals, V-seals, X-seals, flat seals, lip seals, back-up rings, bonded seals and packing elements.

65. (New) The downhole tool system as recited in claim 60 wherein the elastomer host material and the nanomaterial have interfacial interactions.

66. (New) The downhole tool system as recited in claim 60 wherein the nanomaterial structurally complements the elastomer host material.

67. (New) The downhole tool system as recited in claim 60 wherein the nanomaterial chemically complements the elastomer host material.

68. (New) The downhole tool system as recited in claim 60 wherein the nanomaterial structurally and chemically complements the elastomer host material.

69. (New) A downhole tool system comprising:

a first downhole component;

a second downhole component positioned relative to the first downhole component; and

a seal element positioned between and in sealing contact with the first and second downhole components, the seal element comprising an elastomer host material and a nanomaterial integrated with the elastomer host material to form a nanocomposite material, wherein the nanomaterial is a nanoclay.

70. (New) The downhole tool system as recited in claim 69 wherein the elastomer host material further comprises a copolymer of acrylonitrile and butadiene.

71. (New) The downhole tool system as recited in claim 69 wherein the elastomer host material is selected from the group consisting of acrylonitrile butadiene, carboxylated acrylonitrile butadiene, hydrogenated acrylonitrile butadiene, highly saturated nitrile, carboxylated hydrogenated acrylonitrile butadiene, hydrogenated carboxylated acrylonitrile butadiene, ethylene propylene, ethylene propylene diene, tetrafluoroethylene and propylene, fluorocarbon and perfluorocarbon.

72. (New) The downhole tool system as recited in claim 69 wherein the nanomaterial is a montmorillonite nanoclay.

73. (New) The downhole tool system as recited in claim 69 wherein the nanomaterial has a dimension in the range of approximately 0.1 nanometer to approximately 500 nanometers.

74. (New) The downhole tool system as recited in claim 69 wherein the seal element comprises a seal selected from the group consisting of O-ring seals, D-seals, T-seals, V-seals, X-seals, flat seals, lip seals, back-up rings, bonded seals and packing elements.

75. (New) The downhole tool system as recited in claim 69 wherein the elastomer host material and the nanomaterial have interfacial interactions.

76. (New) The downhole tool system as recited in claim 69 wherein the nanomaterial structurally complements the elastomer host material.

77. (New) The downhole tool system as recited in claim 69 wherein the nanomaterial chemically complements the elastomer host material.

78. (New) The downhole tool system as recited in claim 69 wherein the nanomaterial structurally and chemically complements the elastomer host material.

79. (New) A downhole tool system comprising:

a first downhole component;

a second downhole component positioned relative to the first downhole component; and

a seal element positioned between and in sealing contact with the first and second downhole components, the seal element comprising a thermoplastic host material and a nanomaterial integrated with the thermoplastic host material to form a nanocomposite material, the nanomaterial selected from carbon nanotubes and carbon nanofibers.

80. (New) The downhole tool system as recited in claim 79 wherein the thermoplastic host material is selected from the group consisting of polphenylene sulfide, polyetheretherketones and polytetrafluoroethylene.

81. (New) The downhole tool system as recited in claim 79 wherein the nanomaterial has a dimension in the range of approximately 0.1 nanometer to approximately 500 nanometers.

82. (New) The downhole tool system as recited in claim 79 wherein the seal element comprises a seal selected from the group consisting of O-ring seals, D-seals, T-seals, V-seals, X-seals, flat seals, lip seals, back-up rings, bonded seals and packing elements.

83. (New) The downhole tool system as recited in claim 79 wherein the thermoplastic host material and the nanomaterial have interfacial interactions.

84. (New) The downhole tool system as recited in claim 79 wherein the nanomaterial structurally complements the thermoplastic host material.

85. (New) The downhole tool system as recited in claim 79 wherein the nanomaterial chemically complements the thermoplastic host material.

86. (New) The downhole tool system as recited in claim 79 wherein the nanomaterial structurally and chemically complements the thermoplastic host material.